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| 10/596,126 | 05/31/2006 | Euijoon Yoon | 504478.25 | 2554 |
| 27128 7590 06/10/2010 HUSCH BLACKWELL SANDERS LLP 190 Carondelet Plaza Suite 600 ST. LOUIS, MO 63105 | | | | |
| EXAMINER CRAWFORD, LATANYA N | | | | |
| ART UNIT 2813 | | PAPER NUMBER | | |
| NOTIFICATION DATE 06/10/2010 | | DELIVERY MODE ELECTRONIC | | |

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

pto-sl@huschblackwell.com

Office Action Summary

Application No.

10/596,126

Applicant(s)

YOON ET AL.

Examiner

LATANYA CRAWFORD

Art Unit

2813

Period for Reply -- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 10 March 2010.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-23 is/are pending in the application.
- 4a) Of the above claim(s) 1-10, 14 and 16 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 11-13, 15 and 17-23 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 31 May 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

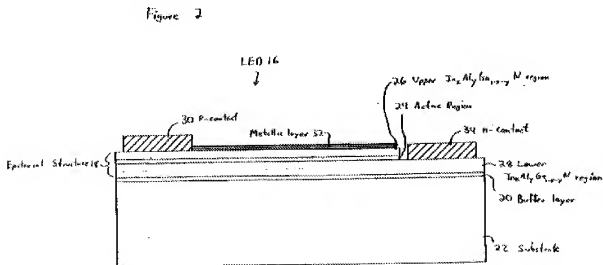
1. This office action is in response to the correspondence filed on 3/10/2010. Currently, claims 1-10 are withdrawn, claims 14 and 16 are cancelled. Claims 11-13, 15, 17-23 are pending.

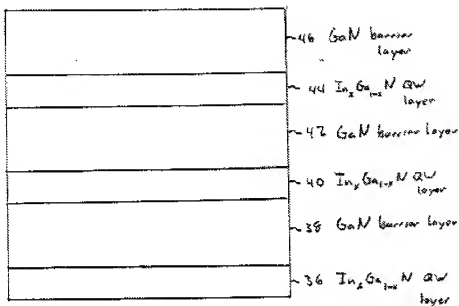
Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 11, 12, 15 & 17-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bour (US Pub no. 2003/0020085 A1).





Regarding claim 11, Bour et al. discloses a nitride semiconductor light emitting device comprising: a substrate; at least one nitride semiconductor layer grown on the substrate (22) and including a top layer (28) of $\text{Al}_x\text{Ga}_y\text{In}_{1-x-y}\text{N}$ ($0 \leq x \leq 1$, $0 < y \leq 1$, $0 < x+y \leq 1$) a single quantum well layer (40) grown on the top layer of $\text{Al}_x\text{Ga}_y\text{In}_{1-x-y}\text{N}$ ($0 \leq x \leq 1$, $0 < y \leq 1$, $0 < x+y \leq 1$) with the top layer of $\text{Al}_x\text{Ga}_y\text{In}_{1-x-y}\text{N}$ ($0 \leq x \leq 1$, $0 < y \leq 1$, $0 < x+y \leq 1$) being mainly supplied from the top layer of $\text{Al}_x\text{Ga}_y\text{In}_{1-x-y}\text{N}$ ($0 \leq x \leq 1$, $0 < y \leq 1$, $0 < x+y \leq 1$) an additional nitride semiconductor layer (26) grown on the In-rich InGaN quantum well layer and having a band gap energy higher than that of the In-rich InGaN quantum well layer (since the quantum well layer is graded where both of the quantum well interfaces have indium concentration near zero [0041-0042] the top layer will have a higher bandgap in view of [0021]); wherein the In-rich InGaN quantum well layer comprises, an

In-rich region formed of $\text{In}_x\text{Ga}_{1-x}\text{N}$, where x in the In-rich region of the quantum well layer is within a range [0042] (Examiner notes that Bour et al teaches that the mole fraction of indium in a graded $\text{In}_{0.5}\text{Ga}_{0.5}\text{N}$ quantum well in accordance with an embodiment of the present invention may range, for example, from about $x=0.5$ to about $x=0$), a first compositional grading region with In content increasing between the top layer of $\text{Al}_x\text{Ga}_{1-x}\text{In}_y\text{N}$ ($0 \leq x \leq 1$, $0 < y \leq 1$, $0 < x+y \leq 1$) second compositional grading region with In content decreasing between the In-rich region and the additional nitride semiconductor layer [0041] but fails to teach the quantum well layer is within a range of 0.5 to 0.8. However, in the case where the claimed ranges "overlap or lie inside ranges disclosed by the prior art" a prima facie case of obviousness exists. In re Wertheim, 541 F.2d 257, 191 USPQ 90 (CCPA 1976); In re Woodruff, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir. 1990) One of ordinary skill in the art at the time of the invention would recognize that it would have been obvious to optimize variables to control the effect of a piezoelectric field in the active region.

Regarding claim 12, Bour et al. discloses wherein the quantum well layer is formed of $\text{In}_x\text{Ga}_{1-x}\text{N}$ and x in the In-rich region of the quantum well layer is from about $x=0.5$ to about $x=0$ [0042] equal to or more than 0.6. A prima facie obvious without showing that the claimed ranges achieve unexpected results relative to the prior art range. In re Woodruff 16 USPQ2d 1935, 1937 (Fed. Cir. 1990) See also In re Huang, 40 USPQ2d 1685, 1688 (Fed. Cir. 1996)(claimed ranges, are unpatentable unless they produce a new and unexpected result which is different in kind and no merely in degree from the results of the prior art). See also In re Boesch, 205 USPQ

215 (CCPA) (discovery of optimum value of result effective variable in known process is ordinarily within skill of art) and In re Aller, 105 USPQ 233 (CCPA 1955) (selection of optimum ranges within prior art general conditions is obvious). One of ordinary skill in the art at the time of the invention would recognize that it would have been obvious to control the effect of a piezoelectric field in the active region.

Regarding claim 15, Bour et al. discloses wherein the thickness of the quantum well is equal to or less than 2nm [0026].

Regarding claim 17, Bour et al. discloses wherein the additional nitride (26) semiconductor is formed of $\text{Al}_y\text{Ga}_{1-y}\text{N}$ ($0 \leq y \leq 1$) fig. 2.

Regarding claim 18, Bour et al. discloses further comprising at least one barrier layer (38) of layer $\text{Al}_y\text{Ga}_{1-y}\text{N}$ ($0 \leq y \leq 1$) and having a band gap energy higher than that of the additional nitride semiconductor layer fig.3 in view of [0021].

Regarding claim 19, Bour et al. discloses wherein the at least one barrier layer of $\text{Al}_y\text{Ga}_{1-y}\text{N}$ ($0 \leq y \leq 1$) [0026].

Regarding claim 20, Bour et al. discloses wherein the quantum well layer (40) and the at least barrier layer (38) of $\text{Al}_y\text{Ga}_{1-y}\text{N}$ ($0 \leq y \leq 1$) form a multi-quantum well structure fig. 3.

Regarding claim 21, Bour et al. discloses wherein the pairs of the quantum well and the at least barrier layer of $\text{Al}_y\text{Ga}_{1-y}\text{N}$ ($0 \leq y \leq 1$) to or less than 100 pairs fig.3.

Regarding claim 22, Bour et al. discloses the top layer of $\text{Al}_x\text{Ga}_{1-x}\text{In}_{1-x-y}\text{N}$ ($0 \leq x \leq 1$, $0 < y \leq 1$, $0 < x+y \leq 1$) is GaN (is capable of being GaN in view of [0003]).

Regarding claim 23, Bour et al. discloses wherein the quantum well layer is formed of $\text{In}_x\text{Ga}_{1-x}\text{N}$ and x in the In-rich region of the quantum well layer is from about $x=0.5$ to about $x=0$ [0042] equal to or more than 0.7. A prima facie obvious without showing that the claimed ranges achieve unexpected results relative to the prior art range. In re Woodruff 16 USPQ2d 1935, 1937 (Fed. Cir. 1990) See also In re Huang, 40 USPQ2d 1685, 1688 (Fed. Cir. 1996)(claimed ranges, are unpatentable unless they produce a new and unexpected result which is different in kind and no merely in degree from the results of the prior art). See also In re Boesch, 205 USPQ 215 (CCPA) (discovery of optimum value of result effective variable in known process is ordinarily within skill of art) and In re Aller, 105 USPQ 233 (CCPA 1955) (selection of optimum ranges within prior art general conditions is obvious). One of ordinary skill in the art at the time of the invention would recognize that it would have been obvious to control the effect of a piezoelectric field in the active region.

4. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Bour (US Pub no. 2003/0020085 A1) in view of Yamada (US Pub no. 2003/0209704 A1).

Regarding claim 13, Bour et al. discloses all the claim limitations of claim 11 but fails to teach wherein the quantum well layer is grown using an In source and a nitrogen source, and the thickness of the quantum well is reduced by growth interruption

which is performed by supplying the nitrogen source with the supply of the In source intercepted to flatten the surface of the quantum well layer.

However, Yamada et al. teaches the thickness of the quantum well is reduced (by way of flattening) [0030]. The limitations: grown using an In source and a nitrogen source, and the thickness of the quantum well is reduced by growth

interruption which is performed by supplying the nitrogen source with the supply of the In source intercepted are not given patentable weight. "Even though product -by[-] process claims are limited by and defined by the process, determination of patentability is based upon the product itself. The patentability of a product does not depend on its method of production. If the product in product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product is made by a different process." *In re Thorpe*, 227 USPQ 964,966 (Fed. Cir. 1985)(citations omitted). A "product by process" claim is directed to the product per se, no matter how actually made, *In re Hirao and Sato et al.*, 190 USPQ 15 at 17 (CCPA 1976) (footnote 3). See also *In re Brown and Saffer*, 173 USPQ 685 (CCPA 1972); *In re Luck and Gainer*, 177 USPQ 523 (CCPA 1973); *In re Fessmann*, 180 USPQ 324 (CCPA 1974); and *In re Marosi et al.*, 218 USPQ 289 (CAFC 1983) final product per se which must be determined in a "product by, all of" claim, and not the patentability of the process, and that an old or obvious product, whether claimed in "product by process" claims or not. Note that Applicant has the burden of proof in such cases, as the above case law makes clear. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the semiconductor light emitting device of

Nakamura et al. with the quantum well layer having a flattened surface taught by Yamada et al. since doing so improves luminous efficiency.

Response to Arguments

5. Applicant's arguments with respect to claims 11-13, 15, 17-23 have been considered but are moot in view of the new ground(s) of rejection. Examiner notes that applicant arguments were unclear with regards to "Bour fails to explicitly disclose a method for forming the alternative grading of the indium mole fraction". The argument is not clear as to what is meant by "alternative" and there is no reference to the claims or specification to indicate what is meant by the term. Applicant further argues that it is readily understood by a person of ordinary skill in the art that it is impossible to form In-rich $\text{In}(x)\text{Ga}(1-x)\text{N}$ region ($0.5 \leq x \leq 0.8$). Examiner notes that applicant must show that the particular range is critical by showing that the claimed range achieves unexpected results relative to the prior art range. In re Woodruff, 979F2d 1575, 16 USPQ 2d 1934 (fed. Cir. 1990)

Inquiry

Any inquiry concerning this communication or earlier communications from the examiner should be directed to LATANYA CRAWFORD whose telephone number is (571)270-3208. The examiner can normally be reached on Monday-Friday 7:30 AM - 5:00 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Landau can be reached on (571)-272-1731. The fax phone

number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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